User's Guide

Power DS Series
1K/2K/3K VA
Uninterruptible Power System
User's Manual

Edition
December, 2000

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Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or specific WARNINGS given elsewhere in this manual will violate safety standards of design, manufacture, and intended use of the instrument. *Sinetec* assumes no liability for the customer's failure to comply with these requirements.

BEFORE APPLYING POWER
Verify that the product is set to match the available line voltage and the correct fuse is installed.

PROTECTIVE GROUNDING
Make sure to connect the protective grounding to prevent an electric shock before turning on the power.

NECESSITY OF PROTECTIVE GROUNDING
Never cut off the internal or external protective grounding wire, or disconnect the wiring of protective grounding terminal. Doing so will cause a potential shock hazard that may bring injury to a person.

FUSES
Only fuses with the required rated current, voltage, and specified type（normal blow, time delay, etc.）should be used. Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE
Do not operate the instrument in the presence of flammable gases or fumes.

DO NOT REMOVE THE COVER OF THE INSTRUMENT
Operating personnel must not remove the cover of the instrument. Component replacement and internal adjustment can be done only by qualified service personnel.

Safety Symbols

	DANGER - High voltage.
	Explanation: To avoid injury, death of personnel, or damage to the instrument, the operator must refer to an explanation in the instruction manual.
	Protective grounding terminal: To protect against electrical shock in case of a fault. This symbol indicates that the terminal must be connected to ground before operation of equipment.
WARNING	The **WARNING** sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** sign until the indicated conditions are fully understood and met.
CAUTION	The **CAUTION** sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the products. Do not proceed beyond a **CAUTION** sign until the indicated conditions are fully understood and met.

⚠ WARNING

This equipment has been tested and found to comply with the limits for Class A computing device pursuant to Subpart J of Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. The equipment generates, uses, and radiates radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of the equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures to correct the interference.

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1. Overview

1.1 About the Product

The DS Series Uninterruptible Power System provides you with the advanced technology in the modern world to protect computer equipment, telecommunication instrument, electrical facilities, medical equipment and so on from damage or loss of data due to power line disturbance or interruption. The design philosophy of power stage is through the combination of a double-conversion circuit and a control circuit of digital signal processing for instant sampling to create continuous power for the load.

1.2 Features

- DSP (Digital Signal Processing) Controller
  The state-of-art DSP controller supplies pure and stable power for 2% distortion and 1% regulation.
- PFC (Power Factor Correction)
  PFC keeps the load-generated harmonics from reflecting back into your line source.
- APLL (Advanced Phase Lock Loop)
  APLL is automatically synchronized to the frequency of line power.
- Cold Start
  When input has no line voltage, or requires the supply of different frequency, the internal batteries in the UPS will provide spare power for output.
- Auto Shut Down/Auto Restart
  In battery mode, and under the circumstance of lower battery voltage, the UPS will be powered off automatically to prevent overdischarge. But if the line voltage recovers and auto restart is enabled, the UPS will be powered on again.
- Automatic Bypass
  Under some special circumstances such as overload, protection or failure, the main power supply will switch to the load via the built-in bypass circuit automatically.
- 110/220V Auto Detect (110V model)
  This auto detect is against wrong insertion.
- Fan Speed Control
  The built-in CPU regulates the fan speed in two stages according to the internal temperature and the amount of output power.
- Graphic LCD Display (2/3KVA)
  This particularly developed LCD is a device with display of high contrast.
- Measurement (2/3KVA)
  The UPS is capable of simple measurement.
- Battery Remaining Time (2/3KVA)
  In battery mode, the UPS can calculate the remaining time.
- Self-Diagnosis
  The CPU can be used to monitor the system’s operation.

1.3 Safety Consideration

The following general safety precautions must be observed during operation, service and repair.

- Do not remove covers. The system is to be maintained by service personnel only.
- Install in a temperature and humidity controlled indoor area, which is free of conductive contaminants.
- The internal battery fuse is required to de-energize the unit before servicing.
- Battery circuit is not isolated from the AC input. Hazardous voltage may exist between battery terminals and ground.
- Mishandling of batteries may cause high energy and chemical hazard.
- Lead acid batteries may cause chemical hazard.

1.4 Functions

Basically, the system is designed into three modes of operation: NORMAL, BATTERY, and BYPASS. In NORMAL mode, AC line power is filtered by EMI filter to reduce spike and noise. Then, it is passed to a converter. The converter rectifies and regulates the AC to a stable DC for inverter power. Then, the inverter outputs a sine wave of low distortion through pulse width modulation (PWM).

When an AC fails or falls out of the specified limits, the mode of operation will switch to BATTERY mode. In BATTERY mode, the converter circuit and charge of the UPS will become inactive. The system will operate in this mode until the battery energy falls to the bottom. When power line recovers, the UPS will check its quality, trace and synchronize its frequency, and finally return to NORMAL mode.

On an extreme condition or malfunction, the UPS will stay in BYPASS mode, or attempt to return to NORMAL mode. In BYPASS mode, the UPS switches from the power to AC line automatically to ensure continuous power to the load.

Saving Mode: This is specially designed for 1KVA 220V. When loading is lower than 60W, the UPS will automatically switch to BYPASS mode for power saving. But when loading is higher than 80W, the UPS will boot to enter into NORMAL mode. This function can be enabled or disabled through the configuration SW on the rear panel.

ⓘ Note
In power saving mode, the UPS will automatically switch to BATTERY mode if power line stops, but there will be a period of time in suspension.

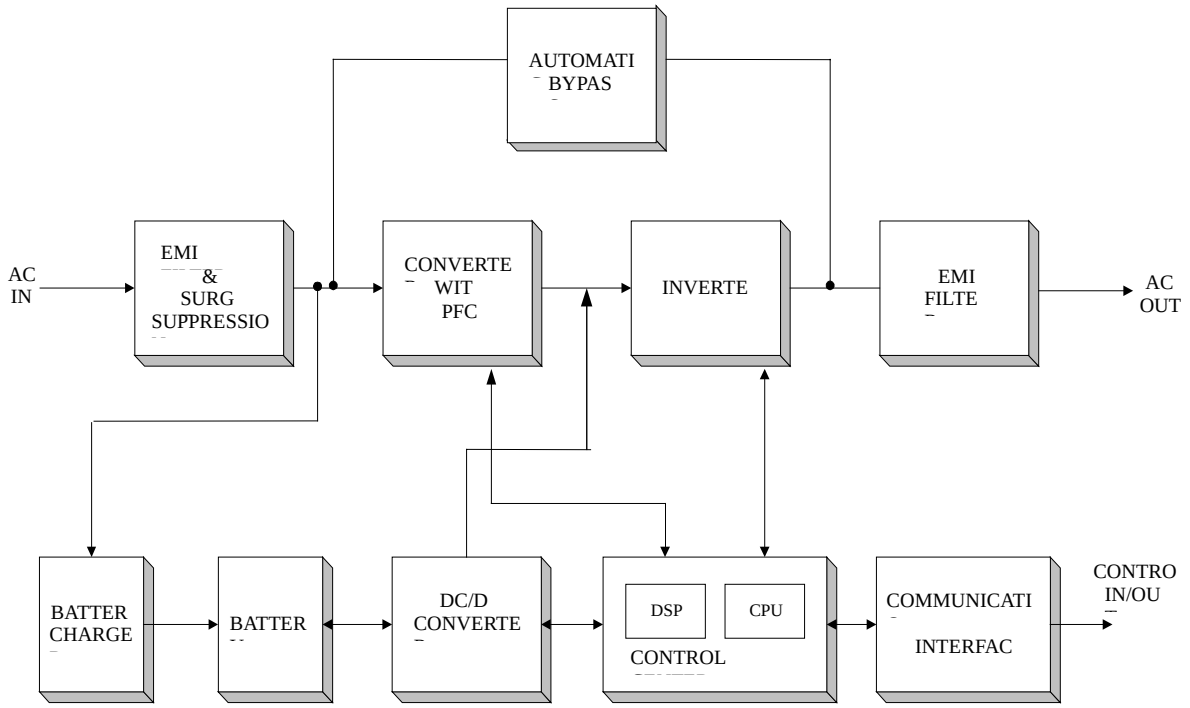


Figure 1-1 System Block Diagram of 1K/2K/3KVA

ⓘ Note

The control center of 1KVA does not contain CPU.

1.5 Front / Rear Panel

1.5.1 Front View

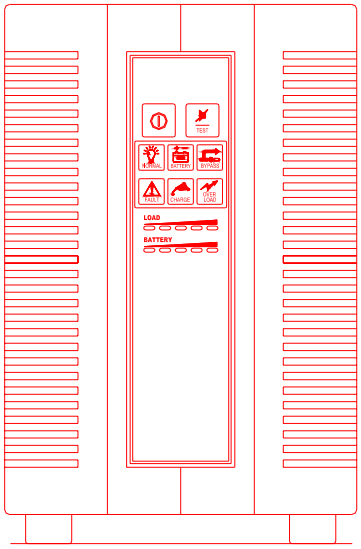


Figure 1-2 1K/700VA-220V Front Panel

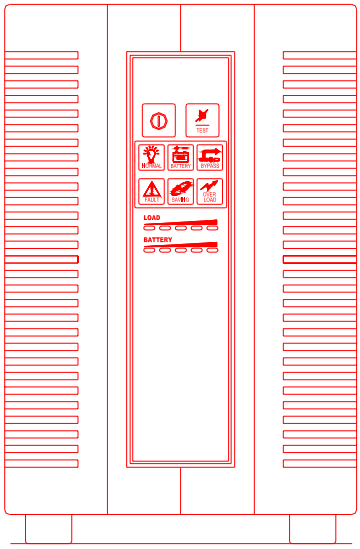


Figure 1-3 1KVA-110V Front Panel

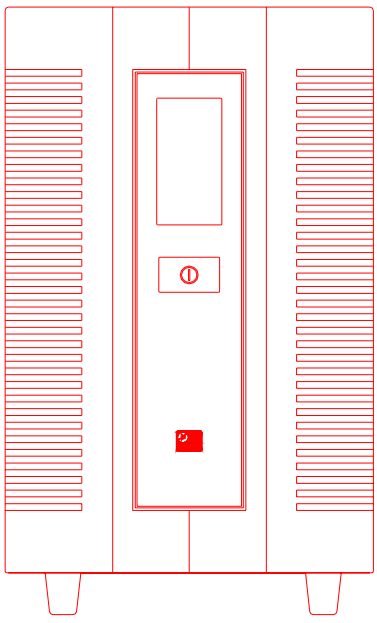


Figure 1-4 2/3KVA Front Panel

1.5.2 Rear View

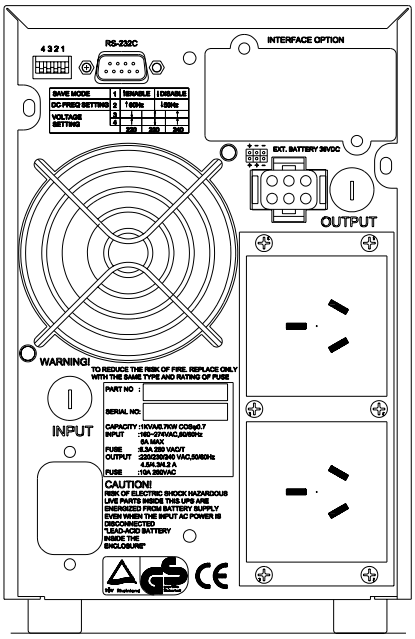


Figure 1-5 1KVA-220V Rear Panel

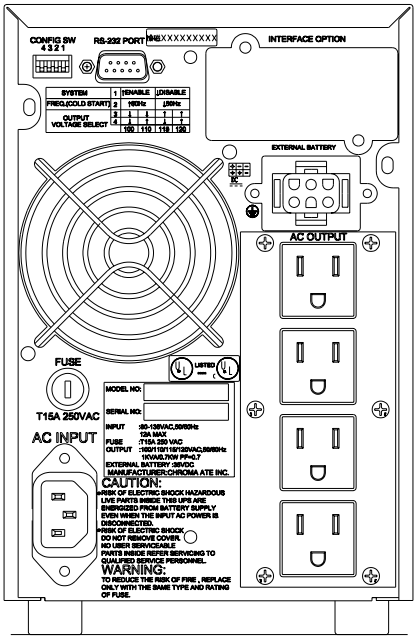


Figure 1-6 1KVA-110V Rear Panel

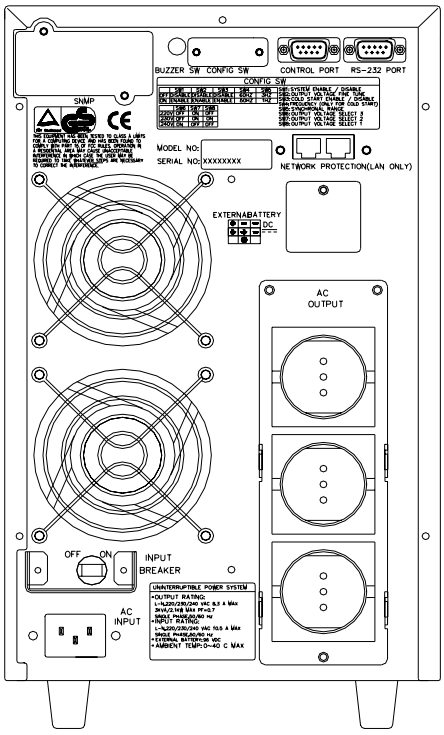


Figure 1-7 2/3KVA-220V Rear Panel

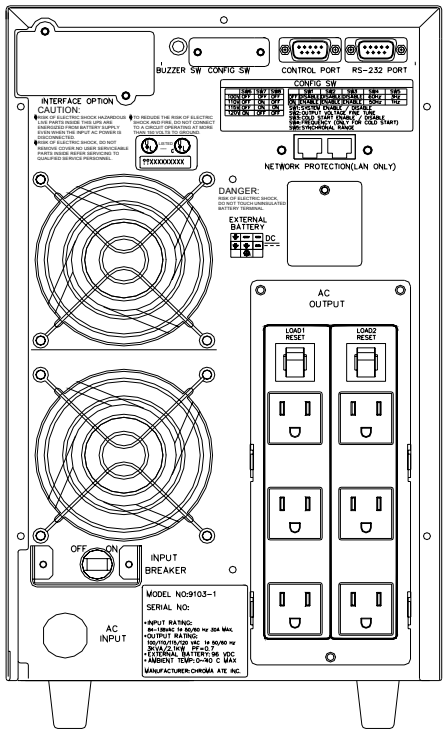


Figure 1-8 2/3KVA-110V Rear Panel

1.5.3 Connectors on the Rear Panel

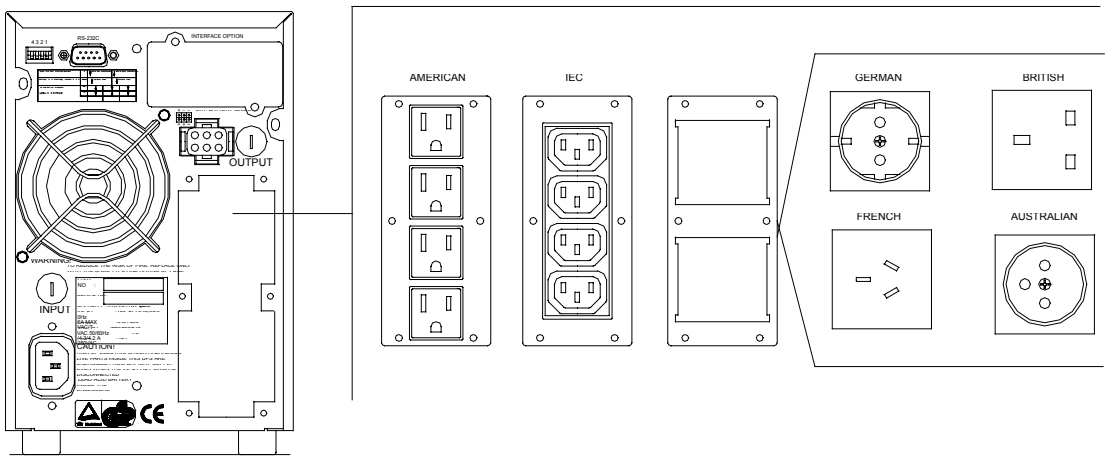
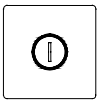


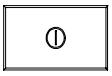
Figure 1-9 Connectors on the Rear Panel

1.6 Four Keys



ON/OFF: Press this key for 1 second to turn on the UPS (1KVA), and press it again for 1 second to turn off.

Test/Buzzer Off: Press this key in NORMAL mode, the UPS (1KVA) will enter into BATTERY mode, and count the time to 6 minutes, or to Battery Low status, and then return to NORMAL mode. If the test time (to Battery Low) is less than 3 minutes, the UPS will issue a warning message to remind you to change the battery. During test you can press this key again to interrupt. When the buzzer sounds, you can also press it to turn off.



ON/OFF: Press this key to turn on the UPS (2/3KVA), and press it again to turn off.

Buzzer On/Off on the Rear Panel: This key controls the sound of buzzer and the fine tune of output voltage for the UPS (2/3KVA). For voltage adjustment see 3.6.

1.7 Display

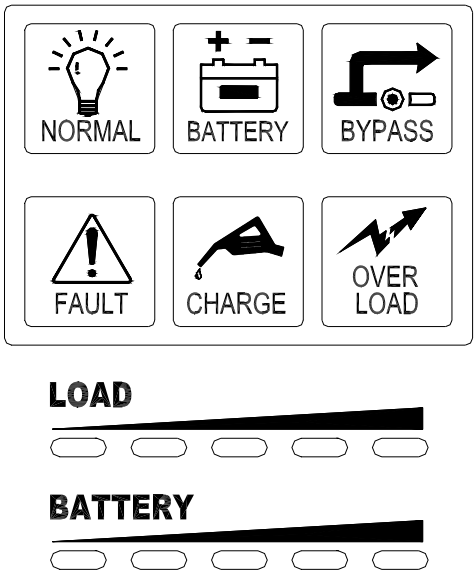


Figure 1-10 1KVA-110V LED Display

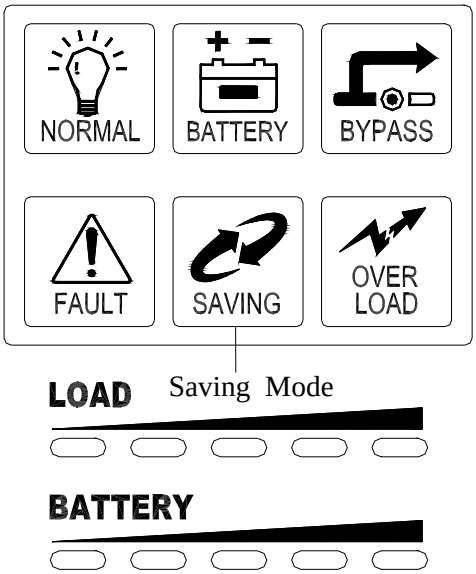


Figure 1-11 1KVA-220V LED Display

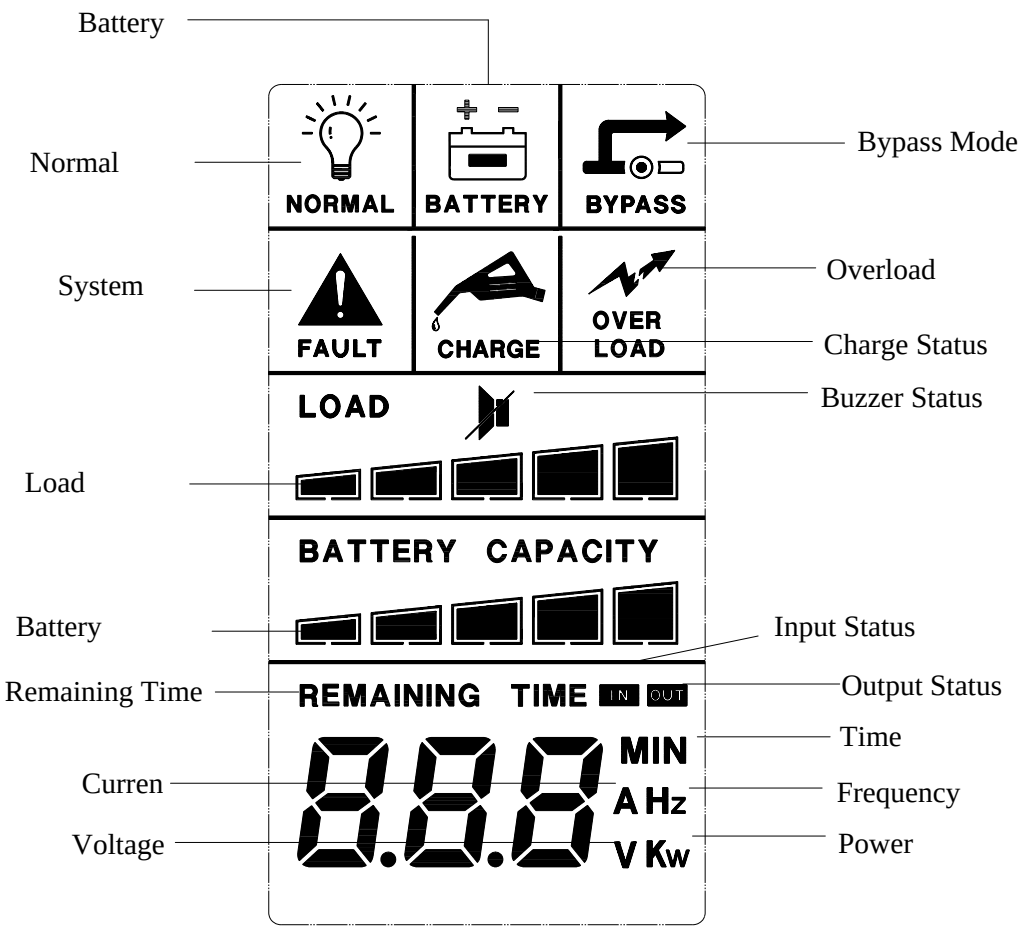


Figure 1-12 2/3KVA LCD Display

NORMAL MODE	**:**	The UPS is in normal mode. It provides stable power in the specification via the inverter to output.
BATTERY MODE	**:**	The UPS is in battery mode. It provides stable voltage in the specification via the inverter to output. When the indicator blinks, it means batteries need changing.
BYPASS MODE	**:**	During power-on or when protection occurs, the UPS will enter into bypass mode.
FAULT	**:**	It means system failure (see error codes). The system may be in Bypass Mode, Output Off or Shutdown.
SAVING MODE	**:**	The UPS will enter into power saving mode when it is lower than 60W. The LED will be lit.
CHARGE	**:**	The batteries are on charge.
OVER LOAD	**:**	The output current or power is in overload status. When overload is 101% ~ 125%, the FAULT light will blink. When overload is 126% ~ 150%, the FAULT light will be lit.

LOAD BAR **:** Five segments show the percentage of output power.

≥10% ≥30% ≥50% ≥70% ≥90%

BATTERY CAPACITY **:** Five segments show the percentage of battery capacity.

20% 40% 60% 80% 100%

REMAINING TIME **:** In battery mode count down the remaining battery capacity by minute. The data is for reference only based on the battery's type, brand, life, temperature, and error made during discharge. The bank time calculation will be inaccurate when using extended battery.
XX.X min indicates the remaining time of discharge.

INPUT VOLTAGE **:** XXX V indicates the input voltage.

INPUT CURRENT **:** XX. X A indicates the input current.

INPUT POWER **:** X.X Kw indicates the actual input power.

INPUT FREQUENCY **:** XX.X Hz indicates the input frequency.

OUTPUT VOLTAGE **:** XX.X V indicates the output voltage.

OUTPUT CURRENT **:** XX.X A indicates the output current.

OUTPUT POWER **:** X.X Kw indicates the actual output power.

OUTPUT FREQUENCY **:** XX.X Hz indicates the output frequency.

The above values are a little different in display, so they are for reference only.

2. Installation

2.1 Precaution

This manual contains **IMPORTANT SAFETY INSTRUCTIONS**, so please **KEEP THE INSTRUCTIONS** for future reference.

- Do not remove the covers
  Only qualified personnel can remove the covers.
- Ventilation Openings
  Do not block the ventilation openings and open the covers during operation as this may cause malfunction when temperature rises.
- Never install in any of the following places, where
  - the temperature and humidity are out of specification.
  - the sunlight is direct, or the heat sources are near.
  - an excessive amount of soot, steam, dust, or corrosive gases are present.
  - high voltage or strong magnetic field sources are near.
- Avoid using unbalanced load, half rectifier, or motor load such as dryer, starter, etc.

2.2 Inspection

- Inspect if the packing material is broken, polluted to affect the machine.
- Unpack the machine carefully and inspect it. If you find the machine is damaged, please keep the packing material, notify the carrier at once, and contact the nearest agent or distributor for appropriate actions.
- Check if the items and amount matches the packing list.

2.3 Setup

The setup is divided into physical part (see 2.3.1) and electrical part (see 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.3.6, 2.3.7, 2.3.8).

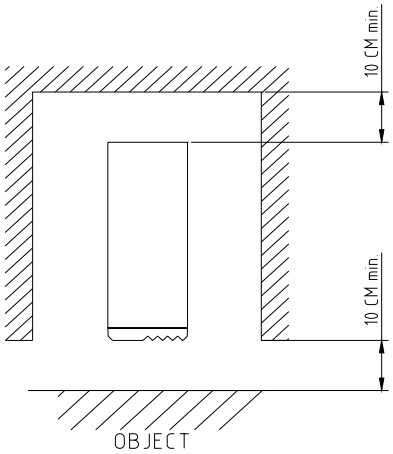
Please install in accordance with the following steps.

WARNING

1. Only qualified personnel authorized by manufacturer can perform the installation.
2. This unit is to operate by any individuals with no previous training.

2.3.1 Placing the UPS

Place the UPS at a location as shown in Figure 2-1 or 2-2, and be sure that the air circulation is good.



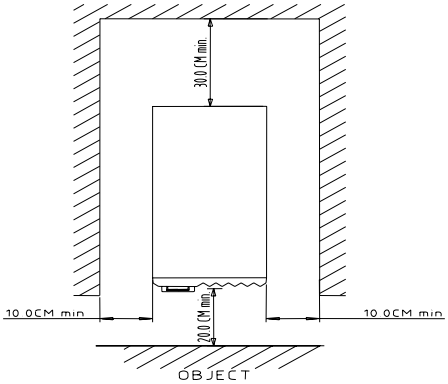


Figure 2-1 Top View of Installing 1KVA Figure 2-2 Top View of Installing 2/3KVA

- The base for placing the UPS must be flat, hard, and can stand the weight of the UPS.
- The temperature in operation environment is from 0°C to 40°C.
- The humidity in operation environment is from 10% to 90% (non-condensing).
- The temperature for storage is from –20°C to 60°C.
- If there is one or more than one extended battery banks (optional), please place them close to the UPS as much as possible.

CAUTION

Do not cover the vent at the side of the UPS.

2.3.2 Providing Power Utility

2.3.2.1 The UPS

- The system adopts single phase, 3-line power source (1∅, 2W + GND).
- Be sure to use the attached power cord.

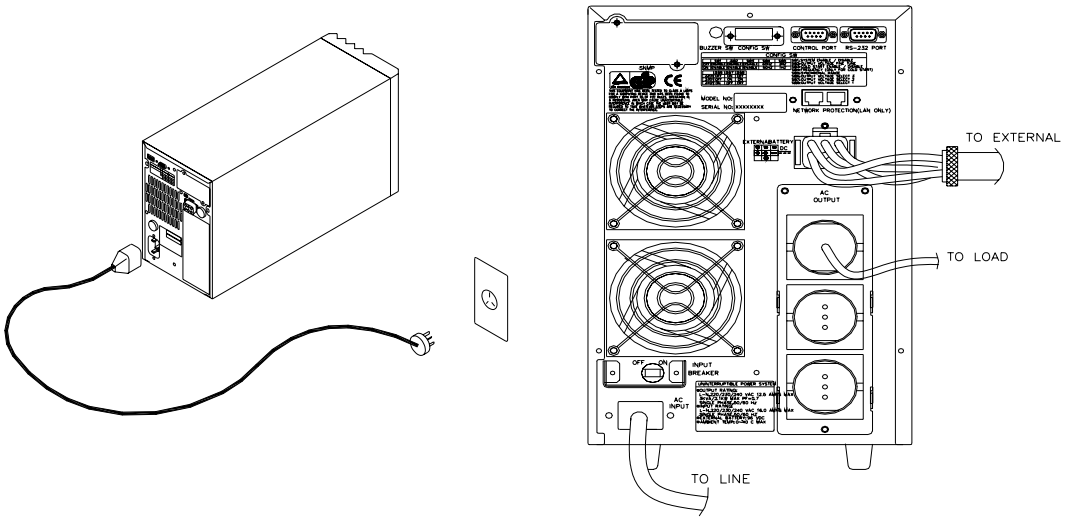


Figure 2-3 The Connection of Power Cord

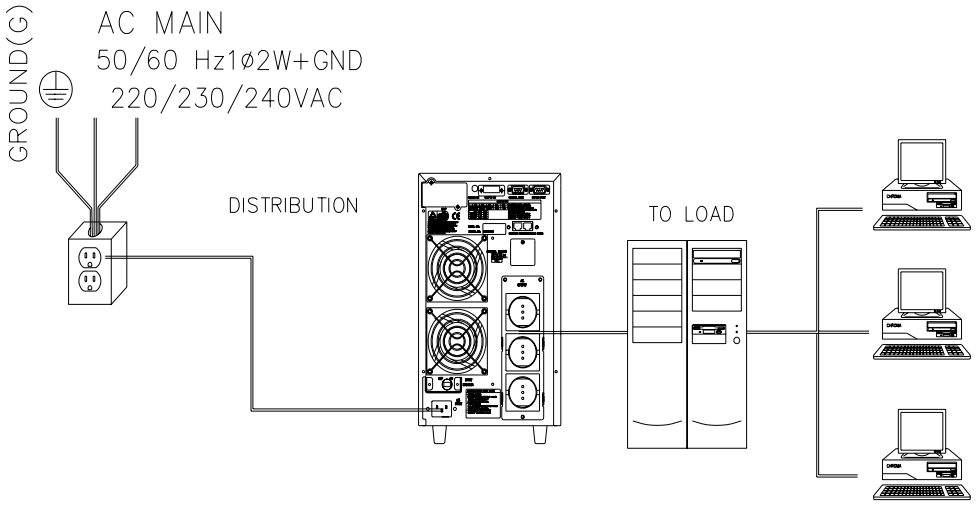


Figure 2-4 Power Utility

CAUTION

To reduce the risk of fire, connect over current protection according to the National Electrical Code ANSI/NFPA 70.

- The measured AC voltage between neutral and ground should be below 30Vac. If not so, improve the grounding quality.

WARNING

Disconnecting the ground system may cause potential shock hazard to operators.

2.3.2.2 The UPS and the Extended Battery Bank

- Power off the UPS before adding the extended battery bank.
- Use the attached power cord without fail.
- Detail installation procedures, please refer to section 2.3.5.

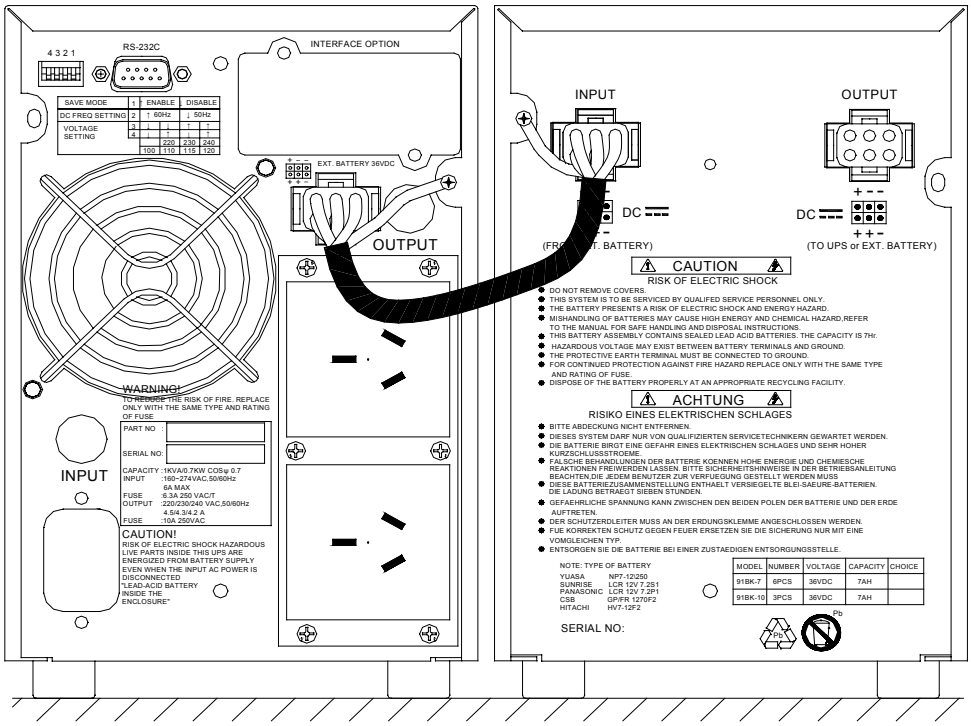

4 3 2 1
RS-232C
INTERFACE OPTION
SAVE MODE
DC FREQ SETTING
VOLTAGE SETTING
ENABLE
DISABLE
↑ 60Hz
↓ 50Hz
220
230
240
100
110
115
120
EXT. BATTERY 36VDC
OUTPUT
WARNING!
TO REDUCE THE RISK OF FIRE, REPLACE ONLY WITH THE SAME TYPE AND RATING OF FUSE
PART NO :
SERIAL NO:
CAPACITY : 1KVA/0.7KW COSψ 0.7
INPUT 160~274VAC,50/60Hz 6A MAX
FUSE 6.3A 250 VAC/T
OUTPUT 220/230/240 VAC,50/60Hz 4.5/4.3/4.2 A
FUSE 10A 250VAC
INPUT
CAUTION!
RISK OF ELECTRIC SHOCK HAZARDOUS LIVE PARTS INSIDE THIS UPS ARE ENERGIZED FROM BATTERY SUPPLY EVEN WHEN THE INPUT AC POWER IS DISCONNECTED
"LEAD-ACID BATTERY INSIDE THE ENCLOSURE"
INPUT
OUTPUT
DC
(TO UPS or EXT. BATTERY)
CAUTION
RISK OF ELECTRIC SHOCK
DO NOT REMOVE COVERS.
THIS SYSTEM IS TO BE SERVICED BY QUALIFIED SERVICE PERSONNEL ONLY.
THE BATTERY PRESENTS A RISK OF ELECTRIC SHOCK AND ENERGY HAZARD.
MISHANDLING OF BATTERIES MAY CAUSE HIGH ENERGY AND CHEMICAL HAZARD,REFER TO THE MANUAL FOR SAFE HANDLING AND DISPOSAL INSTRUCTIONS.
THIS BATTERY ASSEMBLY CONTAINS SEALED LEAD ACID BATTERIES. THE CAPACITY IS 7Hr.
HAZARDOUS VOLTAGE MAY EXIST BETWEEN BATTERY TERMINALS AND GROUND.
THE PROTECTIVE EARTH TERMINAL MUST BE CONNECTED TO GROUND.
FOR CONTINUED PROTECTION AGAINST FIRE HAZARD REPLACE ONLY WITH THE SAME TYPE AND RATING OF FUSE.
DISPOSE OF THE BATTERY PROPERLY AT AN APPROPRIATE RECYCLING FACILITY.
ACHTUNG
RISIKO EINES ELEKTRISCHEN SCHLAGES
BITTE ABDECKUNG NICHT ENTFERNEN.
DIESES SYSTEM DARF NUR VON QUALIFIZIERTEN SERVICETECHNIKERN GEWARTET WERDEN.
DIE BATTERIE BIRGT EINE GEFAHR EINES ELEKTRISCHEN SCHLAGES UND SEHR HOHER KURZSCHLUSSSTROEME.
FALSCHE BEHANDLUNGEN DER BATTERIE KOENNEN HOHE ENERGIE UND CHEMISCHE REAKTIONEN FREIWERDEN LASSEN. BITTE SICHERHEITSHINWEISE IN DER BETRIEBSANLEITUNG BEACHTEN,DIE JEDEM BENUTZER ZUR VERFUEGUNG GESTELLT WERDEN MUSS.
DIESE BATTERIEZUSAMMENSTELLUNG ENTHAELT VERSIEGELTE BLEI-SAEURE-BATTERIEN.
DIE LADUNG BETRAEGT SIEBEN STUNDEN.
GEFAEHRLICHE SPANNUNG KANN ZWISCHEN DEN BEIDEN POLEN DER BATTERIE UND DER ERDE AUFTRETEN.
DER SCHUTZERDLEITER MUSS AN DER ERDUNGSKLEMME ANGESCHLOSSEN WERDEN.
FUE KORREKTEN SCHUTZ GEGEN FEUER ERSETZEN SIE DIE SICHERUNG NUR MIT EINE VOMGLEICHEN TYP.
ENTSORGEN SIE DIE BATTERIE BEI EINER ZUSTAEDIGEN ENTSORGUNGSSTELLE.
NOTE: TYPE OF BATTERY
YUASA NP7-12/250
SUNRISE LCR 12V 7.2S1
PANASONIC LCR 12V 7.2P1
CSB GP/FR 1270F2
HITACHI HV7-12F2
MODEL
NUMBER
VOLTAGE
CAPACITY
CHOICE
91BK-7
6PCS
36VDC
7AH
91BK-10
3PCS
36VDC
7AH
SERIAL NO:
Pb

Figure 2-5 The UPS and the Extended Battery Bank

2.3.3 Emergency Power Off

For safety, operators can remotely power off the UPS during emergency through an external customer supplied switch.

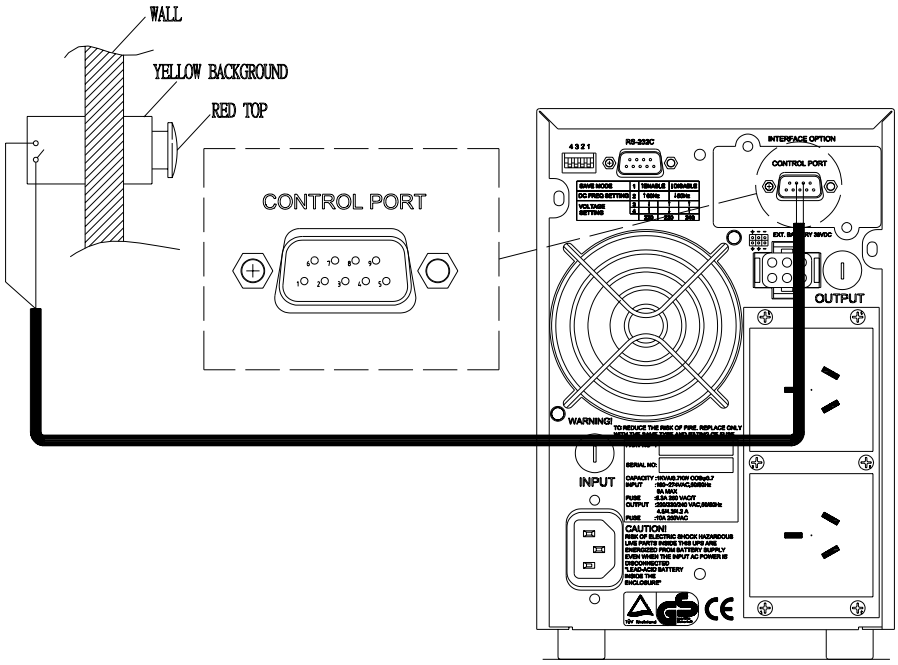


Figure 2-6 Remote EPO Installation

- Pin definition
  Pin 5: Interface GND.
  Pin 9: External switch for EPO function.
- Switch type
  A temporary contact switch is larger than the capacitor of 120V/100mA and color-coded with red push-button in yellow background.
- Switch device must be clearly marked with Emergency Power Off and placed for easy access.
- The extra components like switch, wire and connector are customer-supplied.

WARNING

Do not add voltage to pin 5 and pin 9.

CAUTION

The voltage is about 9V when EPO circuit and shutdown control port are open.

2.3.4 Control & RS-232C Ports

In 2/3K UPS there are two 9-pin D-SUB connectors: contact closure relay and RS-232C port. In 1K there is only one 9-pin D-SUB connector for these two functions.

2.3.4.1 Control Port

The contact closure relay is for signal output. It can connect your computer, local area network (LAN), and control system. You can accomplish the wire connection using the accessories or make them by yourself according to Figure 2-7 (on page 2-8).

Pin Definition (2/3K)	Description
Pin 1: UPS OFF	UPS makes inverter OFF for protection.
Pin 2: INPUT FAIL	When input power does not meet the input conditions.
Pin 3: BYPASS	When UPS is in Bypass Mode.
Pin 4: COMMON	It is for all pins.
Pin 5: LOW BATTERY	When the battery voltage inside UPS is too low.

Pin Definition (1K/700)	Description
Pin 1: UPS OFF IN BYPASS	When UPS is in Bypass Mode.
Pin 4: COMMON	It is for pin 1, pin 6 and pin 8.
Pin 5: INTERFACE GND	When the battery voltage inside UPS is too low.
Pin 6: LOW BATTERY	It is for all pins.
Pin 7: POWER OFF	Power off UPS.
Pin 8: INPUT FAIL	When input power does not meet the input conditions.
Pin 9: EPO	Power off UPS in an emergency.

✧ Normally the relay is OFF (open) but will be ON (close) when any condition occurs.

- The length of the control line cannot exceed 50 meters.
- The rating of relay contact:
  Voltage: 250 Vac or 28 Vdc Max
  Current: 1 Amp Max
- The contact relay and control circuits are electrically insulated from the UPS.

2.3.4.2 RS-232C Port

Pin Definition (1K)	Description
Pin 2: Txd	Data communication of RS-232C
Pin 3: Rxd	Data receiving of RS-232C
Pin 5: Grounding	Grounding of RS-232C

✧ When using SNMP, RS-232C port will be disabled automatically; that is, these two cannot be used together.

You can transfer the data (see Figure 2-7) by connecting the standard RS-232C port on UPS to an IBM compatible PC or the remote SNMP through the optional accessories.

Communication Settings

Control	Setting
Baud Rate	2400
Data Bits	8

Parity	None
Stop Bit	1

CAUTION

Make sure that the UPS and the PC are powered off before connecting the power cord.

2.3.5 Extended Battery Bank

The DS UPS can prolong backup time with additional battery banks (optional) installed.

CAUTION

To avoid electric shock, only qualified personnel are allowed to install the extended battery bank.

1. Before installing the extended battery bank, measure the difference between the battery voltage inside the UPS and the extended battery voltage.
2. When voltage difference is more than 2 Vdc, turn on the UPS to charge the internal battery and raise the voltage, or turn off AC power to let the UPS enter into BATTERY mode to lower the voltage. Only when voltage is the same can you connect.

CAUTION

If the difference between the battery voltage in the UPS and the extended battery voltage is too large, the connection may cause shock and inrush current, and damage the connector.

2.3.6 Configuration Switch

When the DS series UPS is turned on, it will detect the configuration of CONFIG SW on the rear panel to initiate the operating mode.

CAUTION

Only qualified personnel are allowed to configure the switch.

WARNING

Wrong configuration may cause malfunction, or damage the equipment. Adjust the configuration of CONFIG SW according to actual function and your need.

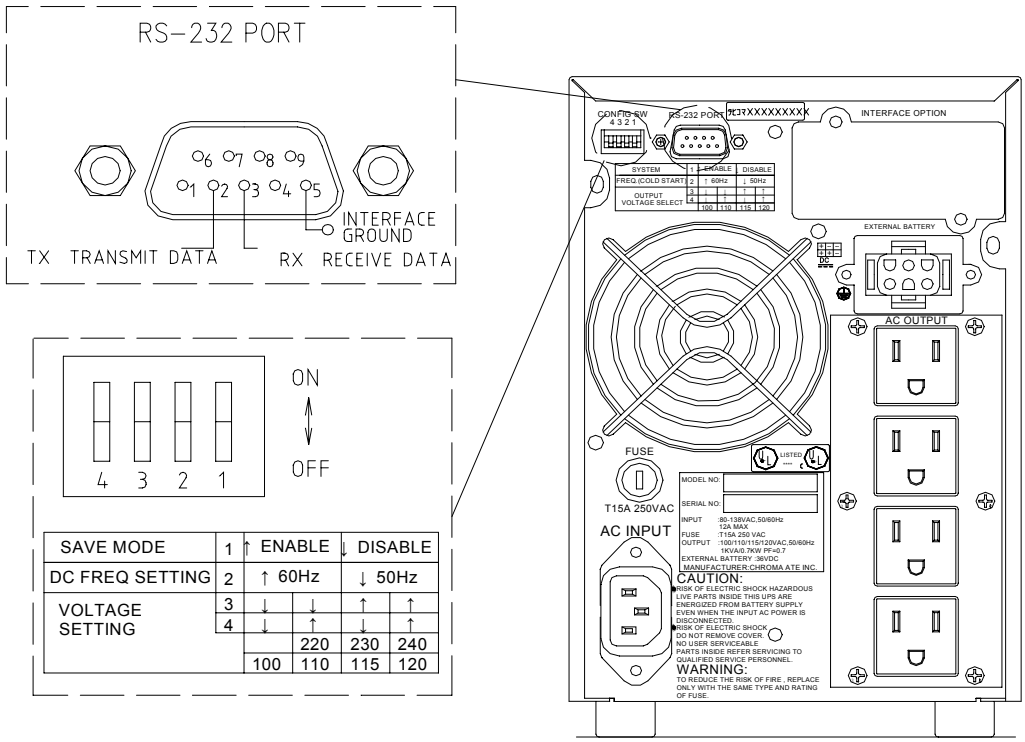


Figure 2-7 The Control Port, RS-232C Port and the Table of CONFIG SW (1KVA)

ⓘ Note

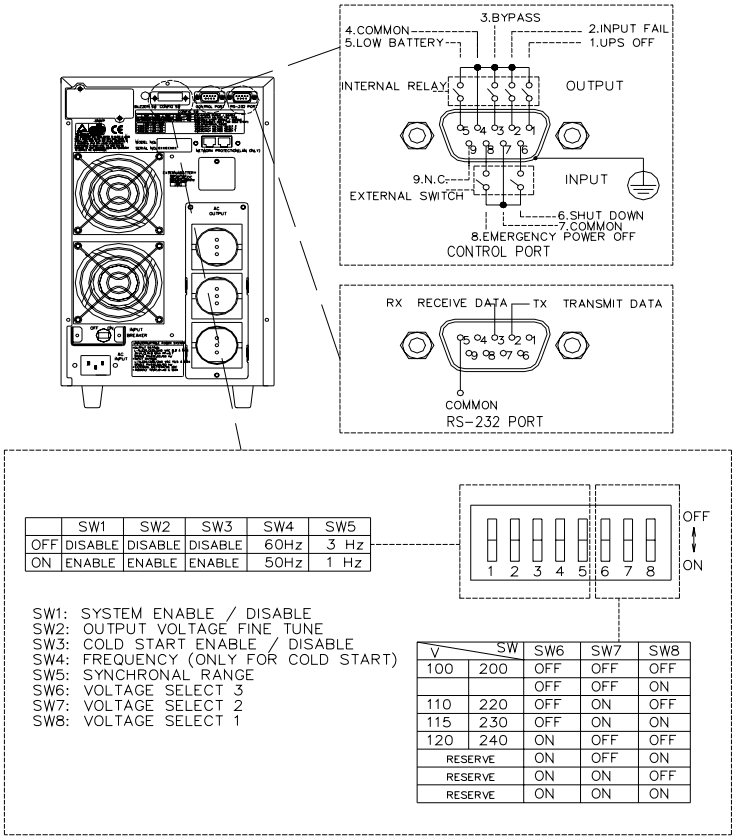
Any changes of setting will take effect after the UPS is restarted.

Definition of Configuration Switch (1KVA)

SW1: Saving Mode (220V)	It switches the UPS to BYPASS mode to save power when it is not connected with a load, or the loading is lower than 60W. The setting can be changed even when the UPS is ON.
SW1: System On (110V)	The switch is designed to protect the UPS from wrong touch during transportation. **Only when the switch is ON can the system work normally** (the default is OFF).
SW2: Frequency	When using the cold start facility, you can choose 50 or 60 Hz as the output frequency using this switch (for cold start only).
SW3: Volt. Select (Bit2) SW4: Volt. Select (Bit1)	Choose a suitable output voltage range by combining these two switches.

CAUTION

Set the correct voltage you need before operation.



	SW1	SW2	SW3	SW4	SW5
OFF	DISABLE	DISABLE	DISABLE	60Hz	3 Hz
ON	ENABLE	ENABLE	ENABLE	50Hz	1 Hz

V	SW	SW6	SW7	SW8
100	200	OFF	OFF	OFF
		OFF	OFF	ON
110	220	OFF	ON	OFF
115	230	OFF	ON	ON
120	240	ON	OFF	OFF
RESERVE		ON	OFF	ON
RESERVE		ON	ON	OFF
RESERVE		ON	ON	ON

Figure 2-8 The Control Port, RS-232C Port and the Table of CONFIG SW (2/3KVA)

Definition of Configuration Switch (2/3KVA)

SW1: System On	The switch is designed to protect the UPS from wrong touch of during transportation. **Only when the switch is ON can the system work normally** (the default is OFF).
SW2: Fine Tune	When switch is ON, you can adjust the output voltage up or down using the buzzer switch.
SW3: Cold Start	Under the circumstance of no AC power input, if you want to output AC power by starting the batteries inside the UPS, you can set the switch ON. However, when the AC power meets the conditions for input, the function is ineffective.
SW4: Frequency	When the conditions for cold start are established, you can choose 50 or 60 Hz as the output frequency using this switch (for cold start only).
SW5: Synchronized Range	Select Sync frequency between input and output. In an area where frequency is unstable, you can choose the range of 3 Hz, whereas in an area of stable frequency, you can choose the range of 1 Hz.
SW6: Voltage Select (Bit 3) SW7: Voltage Select (Bit 2) SW8: Voltage Select (Bit 1)	Choose the fit range of output voltage using the combination of these three switches.

2.3.7 Maintenance

1. Cleaning
   - Please clean the panels and the machine with non-volatile liquid on soft cotton cloth.
   - Inspect the cleanness of the air intake regularly, and clean it with a vacuum cleaner.
2. Maintenance
   - Only qualified technicians or service personnel can perform the maintenance.
3. Battery Replacement
   - Generally a newly purchased set of batteries can last for three to five years.

WARNING

To change batteries, please contact the dealer, and let service personnel do it. Do not change it alone.

   - Do not open or destruct batteries, for the electrolyte is toxic to skin and eyes.
   - Recycle properly according to the local codes on the batteries.
   - The batteries must be replaced with the same type and rating.
   - The batteries fit for use are:

YUASA	NP7-12\250	CSB	GP1270/1272 F2
PANASONIC	LCR 12V 7.2S1	HITACHI	HV7-12 F2
SUNRISE	LCR 12V 7.2P1	B.B.	BP7.5-12/ 8-12

   - Hazardous voltage may exist between battery terminals and ground. Test it before touching.
4. Replacement Procedures
   - Power off the UPS and input power. Remove the wiring and signal connectors of the UPS input and output power.
   - Open the cabinet cover of UPS properly according to the service manual.
   - Remove all connectors between the batteries and PCB.
   - Remove the connecting wires between batteries one by one.
   - Pull out old batteries (do not make polarity short circuit), recycle them, and get replacements.
   - Connect the batteries according to the wiring graph in service manual. All batteries are in series.
   - Measure the total voltage of batteries in series within ±10% of the specifications (see Chapter 4).
   - Connect the connectors back to PCB. Notice that if polarity is not correct, components will be burned. Small sparks inside batteries and PCB connectors are normal.
   - Replace the outer cabinet, and recover the original wiring.

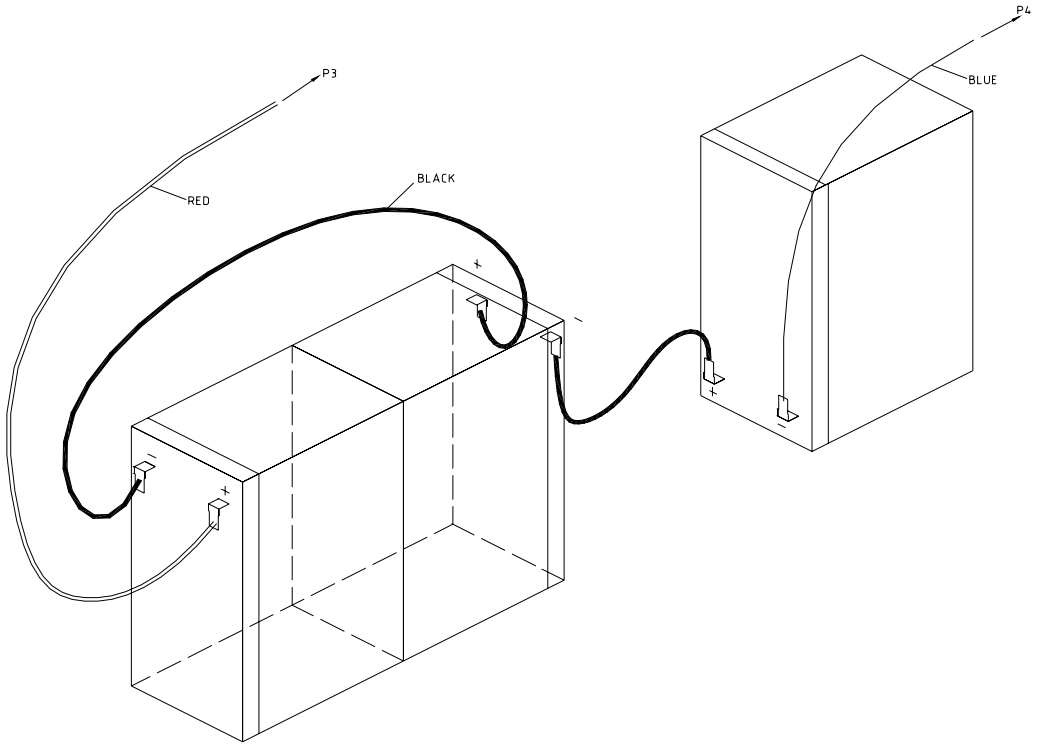
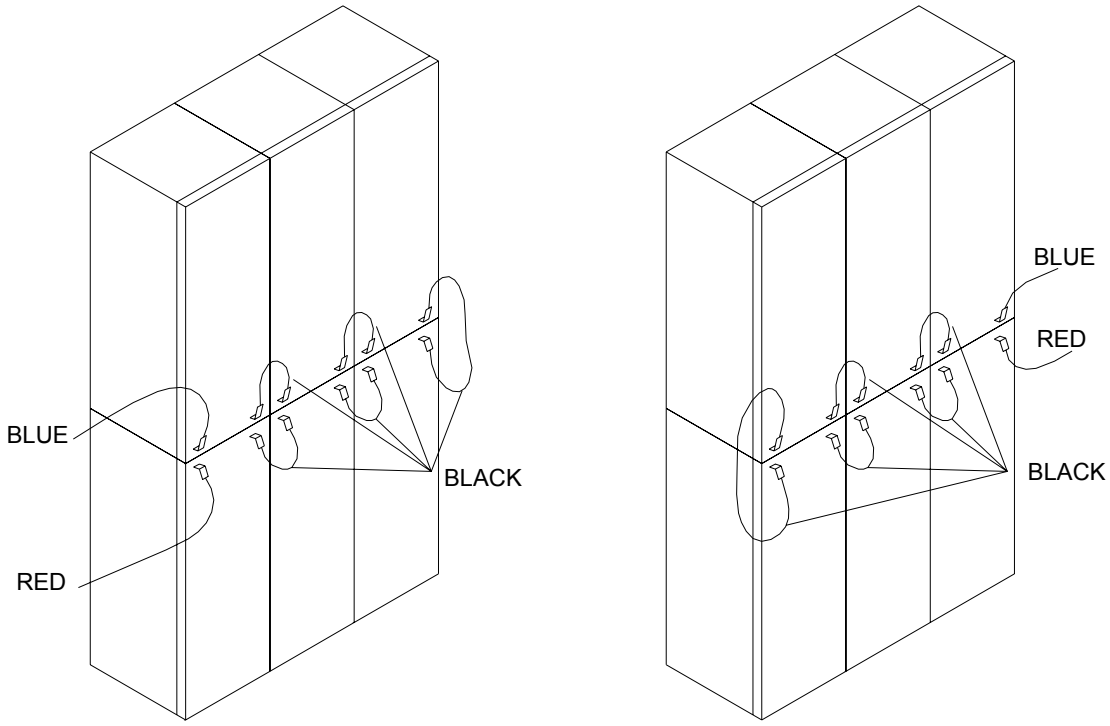
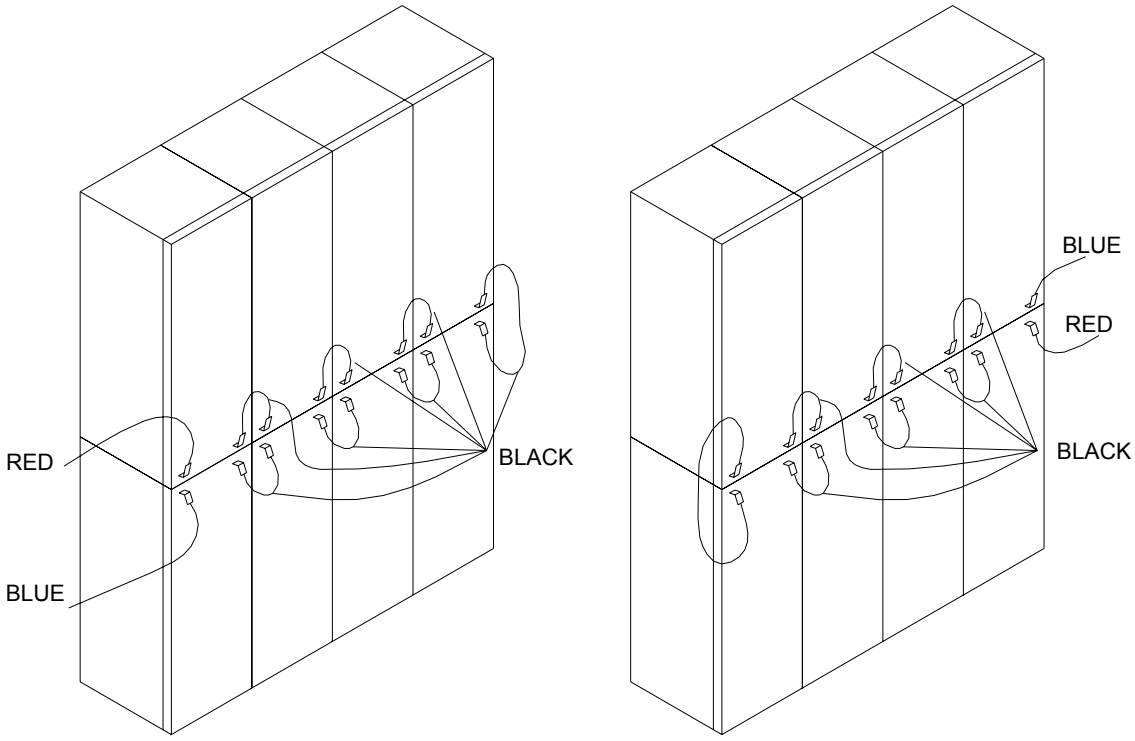


Figure 2-9 The Battery Connecting Wires in 1KVA



back 220V front back 110V front

Figure 2-10 The Battery Connecting Wires in 2KVA



back 220V front back 110V front

Figure 2-11 The Battery Connecting Wires in 3KVA

3. Operation

3.1 Introduction

In order to make the DS series UPS user-friendly, the “Power Switch” is designed on the front panel. Under the operation of a microcomputer, the UPS offers functions like Mode Transfer, Feed Back, Control Display, Communication, and Protection automatically. Once the UPS is powered on, it will act as a guard to protect your equipment from lots of power problems. This chapter guides you how to use the UPS step by step.

3.2 The Flowchart of Operation

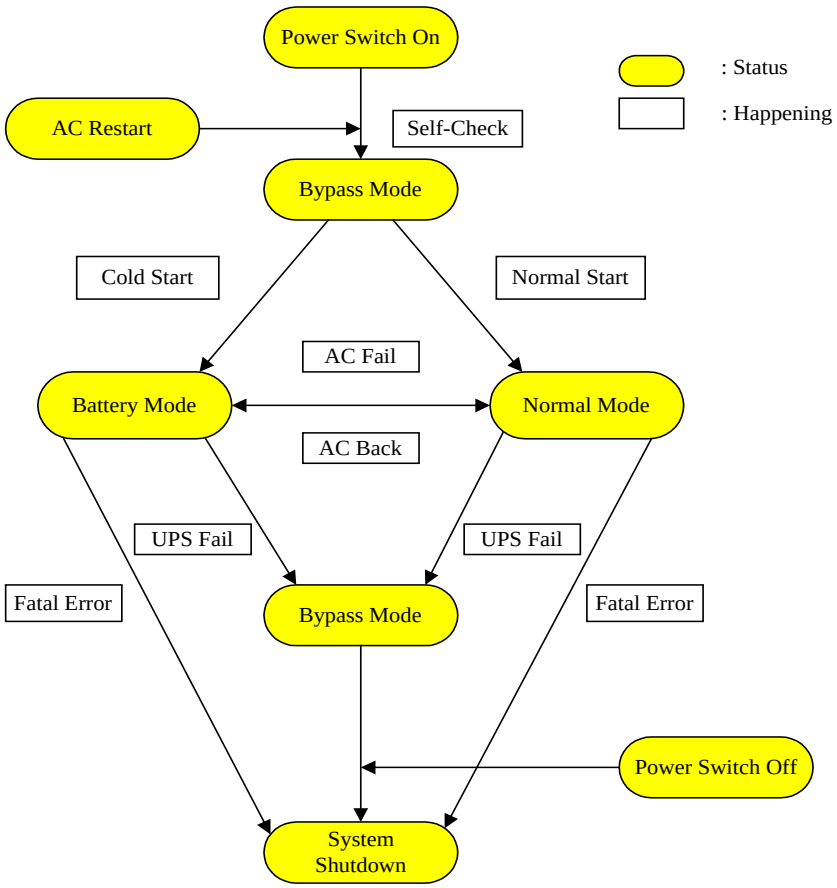


Figure 3-1 The Operation Flowchart

✧ The flowchart may vary slightly from your mode due to the policy of ongoing design and development.

3.3 Checking before Power-On

In order to avoid the failure or damage caused by accidental mistakes, you should check the following list before power-on.

Checkpoint	Result
• Are the Input/Output cables secured?	
• Is the Input/Output grounding correct?	
• Has the wiring of options been completed and tested?	
• Has the desired output voltage been set?	
• Has Sync Range been set? (2/3K)	
• Has Cold Start been set? (2/3K)	
• Has SW 1 System-On been started? (2/3K)	
• Has input circuit breaker been off? (2/3K)	
• Has saving mode been set?	

3.4 Power-On

CAUTION

After powering off the input circuit breaker, wait for one minute at least to power it on. Everything is supposed to be set correctly before pressing the power switch.

1. Power on the input circuit breaker.
2. Press the power switch on the front panel.
3. The system does the self-test automatically.
4. LCD shows the software versions of DSP and CPU.
5. LCD shows the value of input voltage. The UPS enters into Bypass Mode.
6. When AC power meets the fit conditions and finishes synchronization, LCD will show the value of output voltage, and the UPS will enter into Normal Mode.

CAUTION

The backup time in Battery Mode will be reduced if batteries are not fully charged.

3.5 Cold Start

1. Following lists the conditions to use cold start.
   ① There is no AC power, or the power does not meet the input specification.
   ② SW 3 of Configuration SW is in the position of ON (Enable).
2. Perform the first two steps in section 3.4.
3. When self-test is completed, and the conditions of cold start are met, the UPS will switch

to Battery Mode automatically.

CAUTION

The UPS will switch to Normal Mode automatically when the system is started by cold start; the line power recovers, and meets the conditions of input as well as frequency.

3.6 Displaying Measurement

The UPS provides a variety of power measurements. It can easily read the values of voltage, current, frequency as well as power, and display them on LCD.

1. In Normal Mode or Battery Mode, press and hold the buzzer switch on the rear panel for 3 seconds. The displayed item will change every 1.5 seconds. Release the buzzer switch after choosing the item you want, and the light will stay at the item.

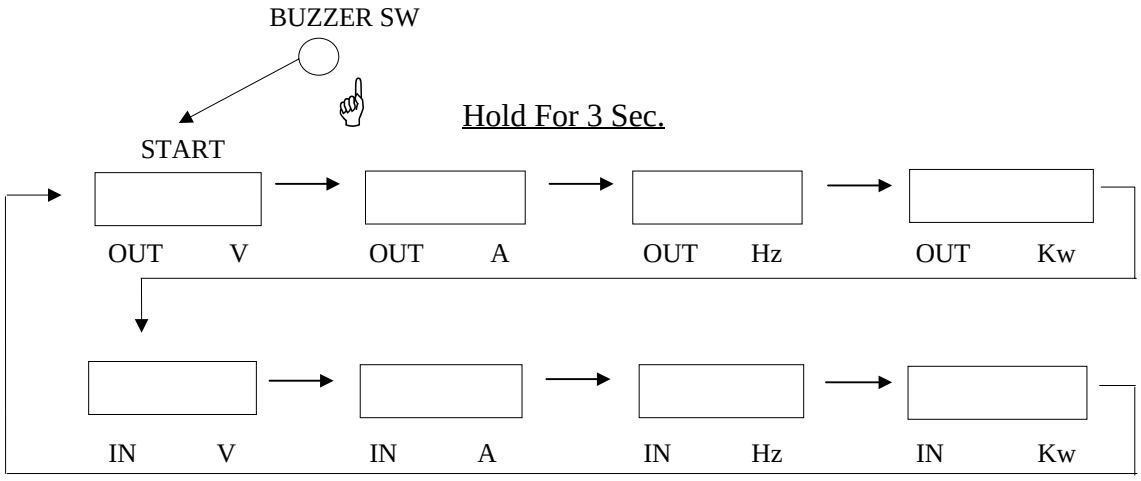


Figure 3-2 The Sequence of Displayed Items

2. When operating in Battery Mode, if release SW, the displayed value will return to the remaining time of battery capacity.

CAUTION

All measured values are for reference only.

3.7 Fine Tune

In order to cope with all kinds of installation sites, voltage drop, and the change or limit of

input voltage from equipment, the DS series UPS can adjust the output voltage with simple setting, and make it reach ± 5Vac max by 1Vac step.

1. In Normal Mode, and when LCD displays output voltage (set it according to section 3.6 if the displayed status is not output voltage), set SW 2 to ON (Enable). The segment of last digit blinks when the fine tune is in process.
2. STEP-DOWN: Keep on pressing buzzer switch, and the output voltage will lower 1Vac per 1.5 seconds.
   STEP-UP: Interrupt for 0.5 second, then press buzzer switch, and the output voltage will raise 1Vac each time.
3. Set SW 2 back to OFF (Disable) after the adjustment.

CAUTION

The output voltage in Battery Mode is same as that after fine tune, but in this mode there is no fine tune function.

3.8 Automatic Shutdown

In Battery Mode and under the circumstance of lower battery voltage, the system will shut the inverter off, keep minimum power consumption, and display error messages. If AC power does not recover after a period of time, the system will shut down automatically to protect the batteries from overdischarge.

CAUTION

Automatic shutdown will work when some protections happen.

3.9 Automatic Restart

After automatic shutdown, if AC power recovers, and is in the specification, the UPS will restart again. If you need to cancel the function of automatic restart, please set the power switch to OFF.

CAUTION

The interval between automatic shutdown and restart should not be less than one minute.

3.10 Automatic Bypass

The UPS has a built-in bypass circuit, which can switch itself to line power for the load

automatically so as to reduce the risk of blackout when it is under abnormal condition. The bypass will switch to line power automatically under the following circumstances.

① Initial power-on in NORMAL mode.
② Overload: 101 ~ 125 % over 60 Sec.
126 ~ 150 % over 10 Sec.
③ The UPS temperature is Over.
④ The UPS is abnormal.

The UPS will try to return to NORMAL mode if it has been switched to BYPASS mode because of encountering the circumstances mentioned above. If the condition occurs thrice consecutively, the UPS will stay in BYPASS mode until the system is reset

CAUTION

Before powering on, please check if the capacity of the equipment exceeds that of Bypass.

4. Specifications

4.1 Specifications of 110V

System Specifications			
Model	**1000DS**	**2000DS**	**3000DS**
Power Capacity	1000VA/700W	2000VA/1400W	3000VA/2100W
Operation Topology	True On-line, double conversion		
Control Topology	DSP	DSP with CPU Control	
Input			
Number of Phase	Single (1∅ 2W +G)		
Nominal Input Voltage	100/110/115/120 Vac		
Input Voltage Range	80-138 Vac		84-138 Vac
Nominal Input Freq.	50/60 Hz (auto sensing)		
Frequency Range	50/60 Hz±5%	45-65 Hz	
Power Factor	>0.97 @ full load	>0.98 @ full load	
Output			
Nominal Output Volt.	100/110/115/120 Vac		
Output Current	10A	20A	30A
Number of Phase	Single (1∅2W +G)		
Voltage Regulation	< 1%		
Voltage T.H.D	< 2% (linear load)		
Sync Range	3 Hz	1 or 3 Hz	
Dynamic Response	±5%@100% load change	±4% @100% load change	
Transient Response Time	1 ms		
Crest Factor	3:1		
Efficiency	>84% (full load)	>86% (full load)	
Frequency Regulation	+/– 0.1 Hz (during mains failure)		
Auto Sync	Yes		
Overload Capacity	125 % for 1 min. 150 % for 30 sec. 300 % for 3 sec.		
Transfer Time	0 ms		
Output Protection	circuit breaker		
Short Protection	Yes		
Regulatory Compliance			
Safety	UL 1778, CSA22.2, VCCI		
EMC Verification	FCC, Part 15, Class A		
Electromagnetic Immunity	IEEE587		
Battery			
Number of Battery	3 pcs	6 pcs	8 pcs
Battery Voltage	36 Vdc	72 Vdc	96 Vdc
Battery Run Time (full/half load)	7/18 min	7/18 min	6/15 min
Charge Time (to 90%)	< 4 hr.		
Battery Type	12V 7AH maintenance-free lead acid		

Features			
Auto Shutdown	Yes		
AC Auto Restart	Yes		
Cold Start	Yes		
Output Fine Tune	Yes		
Fan Speed Control	Yes		
Emergency Power Off	Yes		
Shutdown Control	Yes		
Auto Bypass	Yes		
Serial Interface	Yes		
V, I, P, F Meters	No	Yes	
Battery Meter	Yes		
Error Messages	Yes		
Display	LED display	graphic LCD display with LED back light	
Others			
Operating Temperature	0° to 40°C		
Operating Humidity	10% to 90% none condensing		
Audible Noise	<45 dbA	<50 dbA	<50 dbA
Dimensions(W×D×H)	145×405×222mm	216×616×678mm	216×616×678mm
Weight	14.7 Kgs	30 Kgs	36 Kgs

4.2 Specifications of 220V

System Specifications			
Model	**1000DS**	**2000DS**	**3000DS**
Power Capacity	1000VA/700W	2000VA/1400W	3000VA/2100W
Operation Topology	True On-line, double conversion		
Control Topology	DSP	DSP with CPU Control	
Input			
Number of Phase	Single (1∅ 2W +G)		
Nominal Input Voltage	220/230/240 Vac		
Input Voltage Range	160-274 Vac		
Nominal Input Freq.	50/60 Hz (auto sensing)		
Frequency Range	50/60 Hz±5%	45-65 Hz	
Power Factor	>0.97 @ full load	>0.98 @ full load	
Output			
Nominal Output Volt.	220/230/240 Vac		
Output Current	4.5A	8.3A	12.5A
Number of Phase	Single (1∅2W +G)		
Voltage Regulation	< 1%		
Voltage T.H.D	< 2% (linear load)		
Sync Range	3 Hz	1 or 3 Hz	
Dynamic Response	±5%@100% load change	±4% @100% load change	
Transient Response Time	1 ms		
Crest Factor	3:1		
Efficiency	>84% (full load)	>86% (full load)	
Frequency Regulation	+/– 0.1 Hz (during mains failure)		
Auto Sync	Yes		
Overload Capacity	125 % for 1 min. 150 % for 10 sec.	125 % for 1 min. 150 % for 30 sec.	

	300 % for 3 sec.	300 % for 3 sec.	
Transfer Time	0 ms		
Output Protection	circuit breaker		
Short Protection	Yes		
Regulatory Compliance			
Safety	IEC 950/EN 50091-1-1		
EMC Verification	EN 50091-2		
CE Marking	Yes		
Electromagnetic Immunity	IEC 1000-4-2/IEC 801-2 ESD level 3 IEC 1000-4-3/IEC 801-3 RS level 2 IEC 1000-4-4/IEC 801-4 EFTlevel 2 IEC 1000-4-5/IEC 801-5 SIR level 3 (1K/700VA) IEC 1000-4-5/IEC 801-5 SIR level 4 (2/3KVA)		
Battery			
Number of Battery	3 pcs	6 pcs	8 pcs
Battery Voltage	36 Vdc	72 Vdc	96 Vdc
Battery Run Time (full/half load)	7/18 min	7/18 min	6/15 min
Charge Time (to 90%)	< 4 hr.		
Battery Type	12V 7AH maintenance-free lead acid		
Features			
Auto Shutdown	Yes		
AC Auto Restart	Yes		
Cold Start	Yes		
Output Fine Tune	Yes		
Fan Speed Control	Yes		
Emergency Power Off	Yes		
Shutdown Control	Yes		
Auto Bypass	Yes		
Serial Interface	Yes		
V, I, P, F Meters	No	Yes	
Battery Meter	Yes		
Error Messages	Yes		
Display	LED display	graphic LCD display with LED back light	
Others			
Operating Temperature	0° to 40°C		
Operating Humidity	10% to 90% non-condensing		
Audible Noise	<45 dbA	<50 dbA	<50 dbA
Dimensions(W×D×H)	145×405×222mm	216×616×678mm	216×616×678mm
Weight	14.7 Kgs	30 Kgs	36 Kgs

4.3 Battery Run Time Chart

Battery Run Time VS Load (Minute)			
LOAD	**1000DS**	**2000DS**	**3000DS**
100 VA	150	300	420
200 VA	70	150	190
300 VA	30	110	140
400 VA	22	70	110
500 VA	18	55	80
600 VA	15	30	50
800 VA	11	22	30
1000 VA	7	18	23
1500 VA	-	10	15
2000 VA	-	7	11
2500 VA	-	-	8
3000 VA	-	-	6

- The time of discharge listed above is for reference only. The actual situation depends on the change of load, the temperature of environment, the type of battery, and the improvement of product.

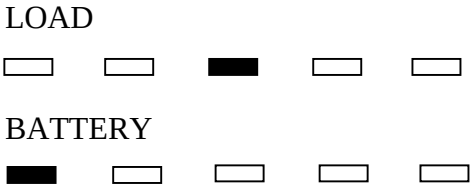
5. Troubleshooting

Troubleshooting Guide

Condition	Possible Cause	Action
Nothing shows on LCD after power switch is in the status of ON.	Internal batteries' voltage is out of specifications.	Contact local service personnel.
E10 shows on LCD after power switch is ON.	Configuration switch is in OFF position.	Turn on SW 1 on the rear panel.
The system enters into Battery Mode after power switch is ON.	Cold start has been enabled, and there is no AC input.	Check AC input power supply or wiring. Contact local service personnel if you are in trouble.
The switch between Normal Mode and Battery Mode is frequent.	The fluctuation of input voltage and frequency is too large.	Check the input condition. Adjust Sync Range to 3Hz, and lower the load. Contact local service personnel if you are in trouble.
The UPS stops midway for overload or short circuit.	The use of load is too much.	Reduce the use of load, and eliminate short circuit.

Appendix A Error Messages

- The UPS uses LED to indicate the error message number that detected by the internal microcomputer so as to let you or maintenance personnel fix the error quickly when it fails.
- There is an LED on the front panel of 1000DS.
- The description of each error message number is explained below:
  When fault LED is ON, it means that there is something wrong with the UPS.
  The load bar means two digits.
  The battery bar means one digit.
  Below indicates “E31”, which means ‘Power is over 125% for 10 seconds.’



- 1K/700VA error message numbers and their description are listed as below.

Error	Description
E01	There is an error in system RAM data read/write.
E02	Charger fault.
E03	Battery voltage is under specification (AC mode).
E04	Battery voltage is over specification (AC mode).
E05	Thermo sensor is dead.
E10	There is an error in voltage setting.
E13	Output/input voltage difference is out of 1.5% (AC tracking mode).
E20	Frequency difference between output and normal exceeds 0.1 Hz (DC mode).
E22	+DC bus voltage is out of the range: +10% to −15%.
E23	−DC bus voltage is out of the range: +10% to −15%.
E24	Phase unlocks between input and output.
E30	Power is over 100% for 60 seconds.
E31	Power is over 125% for 10 seconds.
E32	Power is over 150% for 3 seconds.
E34	Power factor is below 0.3.
E40	Temperature is out of range.
E41	RMS current is over 100% for 60 seconds.
E42	RMS current is over 125% for 10 seconds.
E43	RMS current is over 150% for 3 seconds.
E44	Peak current is over 300% of RMS current.
E45	Power is over 100% or RMS current is over 100% (DC mode).
E50	Suspend mode.
E51	There is an error in test mode (<3 min).

E52	RMS current is over 300%.
E53	Battery test fails (batteries are likely to be damaged).
E54	The live wire and neutral wire of line cord are connected contrarily.
E55	Input voltage is over 150V (for 110V model).

- There are LCDs on the front panels of 2000DS and 3000DS.
- The error message numbers of 2/3KVA and their descriptions are given below:

Error	Description
E00	System ROM checksum errs or model mismatches.
E01	System RAM data read/write err.
E03	Communication fails between CPU & DSP.
E04	Charger fault
E06	Battery voltage is under specification (AC Mode).
E07	Battery voltage is over specification (AC Mode).
E10	Configure SW 1 is set as "OFF".
E12	DC Mode battery voltage is out of range during cold start.
E17	Input frequency fails (out of 45~65 Hz @ 1 Hz/sec. AC Mode).
E18	Input frequency is out of lock range (Free Run Mode).
E20	AC input voltage is out of range.
E21	AC input frequency is out of range.
E22	DC bus voltage exceeds allowed value (–85% <+12%).
E23	The voltage difference on two ends of DC bus exceeds 70Vdc.
E25	Input/Output frequency difference is out of 1 Hz.
E26	Battery voltage is out of range at DC Mode.
E30	Peak current is over 300% of RMS current.
E31	RMS current is over 125% for 60 sec.
E32	RMS current is over 150% for 10 sec.
E34	Output Power factor is below 0.3.
E37	Battery fails after discharge.
E40	Temperature is out of range.
E41	RS-232C receiver buffer is full.
E53	Battery test fails (batteries are likely to be damaged).
E54	The live wire and neutral wire of line cord are connected contrarily.
E60	Transfer fails during Bypass to Normal Mode.
E63	Transfer fails during Battery to Normal Mode.
E69	Input/output sync lasts too long.
E78	DIP Switch setting errs.
E80	Clearing of DSP initially set data errs.
E81	There is no response when CPU sends data to DSP.
E82	Transmission of DSP initial data errs.
E83	Transmission of data fails.
E84	Input voltage is wrong in Bypass Mode.
E89	RMS of output current is more than 200%.